REMARKS

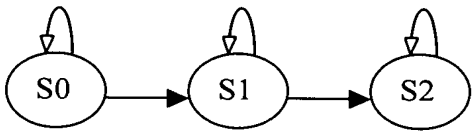
Claims 1-9 are pending in this application. By this Amendment, claim 1 is amended. Support for the amendment may be found, for example, in paragraph [0107] of the present specification. No new matter is added. Applicants respectfully request reconsideration and prompt allowance of the pending claims at least in light of the following remarks.

Claims 1-9 are rejected under 35 USC § 101 as being directed to non-statutory subject matter. Applicants respectfully traverse the rejection.

Claims 1-9 are rejected as allegedly being directed to a process that "simply manipulates an abstract idea without a claimed limitation to a practical application ...." However, claim 1 recites "performing speech recognition using the retrained HMM," which is a practical application. Withdrawal of the rejection is therefore respectfully requested.

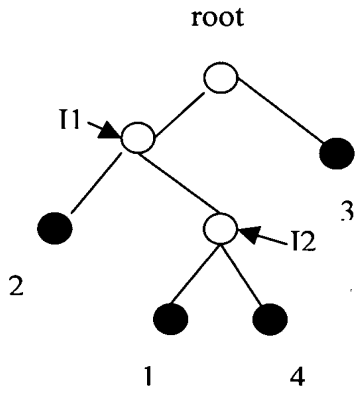
Claims 1-9 are rejected under 35 USC § 102(a) as being anticipated by Shinoda et al. (HMM Size Reduction Using MDL Criterion, Japan, March 2002) (hereafter, "Shinoda"). Applicants respectfully traverse the rejection.

Shinoda does not support the rejection for at least the reason that it does not disclose "selecting a state having the Gaussian distribution number whose description length is minimum, for every state," as recited in claim 1. Instead, in Shinoda, a state is never selected because a distribution or aggregate rather than a state is selected. For better understanding, a discussion of an example application of Shinoda's method follows.



Assume the above HMM state diagram for a phoneme HMM/a/. For example, S2 is one state. Further assume four Gaussian distributions, called "element pdfs" (pdf=probability density function) per state. In other words, a "distribution number" per state is four.

Consider state S0 of phoneme HMM/a/. In Shinoda, a tree structure of the element pdfs is generated for each state other than state S0, say, state S1 or S2. Each element pdf is assigned to a leaf node of the tree structure. An example of such a tree structure is given below:



The black nodes are leaf nodes. Thus, each black node is assigned an element pdf, say, 2, 1, 4 and 3 respectively, from left to right.

A new pdf, called a "cluster pdf," is estimated from the element pdfs of the leaf nodes assigned to intermediate nodes of the tree structure. Thus, for intermediate node I2, a new cluster pdf is generated from element pdfs 1 and 4, and assigned to intermediate node I2. For intermediate node I1, a new cluster pdf is generated from element pdfs 2, 1 and 4, and assigned to intermediate node I1.

Now, for convenience designating intermediate node I1 "node 1," leaf node assigned element pdf 3 "node 2," leaf node assigned element pdf 2 "node 4," intermediate node I2 "node 5," leaf node assigned element pdf 1 "node 6" and leaf node assigned element pdf 4 "node 7,"combinations of nodes 1, 2, 4, 5, 6 and 7 (i.e, nodes of the tree structure excluding the root node) are considered, as shown below:

{1, 2}, {4, 2}, {5, 2}, {6, 2}, {7, 2}, {4, 5}, {4, 6}, {4, 7}, {6, 7}, {4, 6, 2}, {4, 6, 7},

{6, 7, 2}, {4, 6, 7, 2}. If combinations of nodes in the parent relationship can be added, the number of combinations further increases. E.g., [1, 5], [1, 4], [5, 6], [5, 7], etc.

MDL (Minimum Description Length) is calculated individually with respect to the node sets (node combinations) above. A node set with the smallest value is an optimal "Gaussian distribution aggregation" for a given state (in this example, state S0).

In this example, the MDL value for the node set {6, 7} is the smallest. Thus, the distribution number of state S0 becomes two, which means that the distribution number was reduced from the original four. Furthermore, the optimal distribution for state S0 is a distribution assigned to nodes 6 and 7.

The above-described processing is also performed for states S1 and S2, and other phoneme HMMs, thus reducing the distribution number for each state of all phoneme HMMs. Then, all HMMs are learned again.

As indicated earlier, it can be seen from the above discussion that in Shinoda a state is never selected because a distribution or aggregate rather than a state is selected. Therefore, Shinoda never discloses "selecting a state having the Gaussian distribution number whose description length is minimum, for every state" as recited in claim 1. Accordingly, claim 1 is allowable over Shinoda for at least that reason.

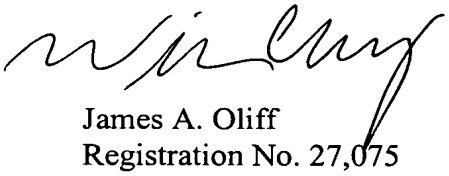
Furthermore, dependent claims 2-9 are likewise allowable over Shinoda for at least the reasons discussed above, as well as for the additional features they recite. For example, Shinoda discloses none of the parameters recited in claim 2. As another example, the subject matter of claim 5 relates to time correlation of data (HMM) used for MDL calculation and speech data for learning; Shinoda is silent as to this subject matter. As a still further example, Shinoda does not mention syllable HMMs, as by contrast are recited in claim 7. As a still further example, Shinoda does not mention a common state of a syllable HMM, as recited in claim 8.

In light of the above, withdrawal of the rejection of claims 1-9 as anticipated by Shinoda is respectfully requested.

In view of the foregoing, it is respectfully submitted that this application is in condition for allowance. Favorable reconsideration and prompt allowance of the claims are earnestly solicited.

Should the Examiner believe that anything further would be desirable in order to place this application in even better condition for allowance, the Examiner is invited to contact the undersigned at the telephone number set forth below.

Respectfully submitted,



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